

Claims

1. A catalyst-coated ion-conducting membrane for electrochemical devices, which comprises a membrane having front and reverse sides (1), at least one catalyst layer (3) and a sealing material (4), wherein the sealing material (4) is applied in the edge region of the ion-conducting membrane (1).
2. The catalyst-coated ion-conducting membrane as claimed in claim 1, wherein the thickness of the sealing material (4) (d_D) corresponds to at least the thickness of the catalyst-coated ion-conducting membrane (d_{CCM}).
3. The catalyst-coated ion-conducting membrane as claimed in claim 1, wherein the sealing material (4) contacts the ion-conducting membrane (1) circumferentially in an edge region of at least 1 mm on one side.
4. The catalyst-coated ion-conducting membrane as claimed in any of claims 1 to 3, wherein the at least one catalyst layer comprises precious metal based catalysts and is applied over the entire area of the ion-conducting membrane.
5. The catalyst-coated ion-conducting membrane as claimed in any of claims 1 to 4, which comprises both a catalyst layer on the front side (2) and a catalyst layer on the reverse side (3) of the ion-conducting membrane.
6. The catalyst-coated ion-conducting membrane as claimed in any of claims 1 to 5, wherein the sealing material comprises thermoplastic polymers and/or copolymers from the group consisting of

- polyethylenes, polypropylenes, polytetrafluoro-
etylenes, PVDF, polyesters, polyamides, polyamide
elastomers, polyimides and polyurethanes, elasto-
ers from the group consisting of silicones,
5 silicone elastomers, EPDM, fluorinated elastomers,
perfluorinated elastomers, chloroprene elastomers,
fluorosilicone elastomers and/or thermoset
polymers from the group consisting of epoxy
resins, phenolic resins and cyano-crylates.
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7. The catalyst-coated ion-conducting membrane as
claimed in any of claims 1 to 6, wherein the ion-
conducting membrane comprises organic polymers
such as proton-conducting perfluorinated polymeric
15 sulfonic acid compounds, doped polybenzimidazoles,
polyether ketones, polysulfones and/or ion-
conducting ceramic materials.
8. A membrane-electrode assembly for electrochemical
20 devices, which comprises an ion-conducting
membrane having front and reverse sides (1), a
first catalyst layer on the front side (2), a
second catalyst layer on the reverse side (3), a
first gas diffusion layer (5) on the front side, a
25 second gas diffusion layer on the reverse side (6)
and a sealing material (4), wherein the sealing
material (4) contacts the insides of each of the
gas diffusion layers (5) and (6) in the edge
region.
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9. The membrane-electrode assembly as claimed in
claim 8, wherein the sealing material contacts the
insides of the gas diffusion layers (5) and (6)
circumferentially in the edge region to a width of
35 at least 1 mm.
10. The membrane-electrode assembly as claimed in
claim 8 or 9, wherein the gas diffusion layers (5)

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and (6) comprise porous, electrically conductive materials such as woven carbon fiber fabrics, carbon fiber felts or carbon fiber papers.

- 5 11. A process for producing a catalyst-coated ion-conducting membrane having an integrated sealing material, which comprises
- 10 - providing an ion-conducting membrane (1) having at least one catalyst layer applied over the entire area and
- 15 - applying the sealing material (4) in the edge region of the ion-conducting membrane (1) on one side with the aid of elevated pressure and/or elevated temperature.
12. A process for producing a membrane-electrode assembly having an integrated sealing material,
- 20 which comprises
- 25 - providing a catalyst-coated ion-conducting membrane with sealing material as claimed in any of claims 1 to 7, and
- 30 - applying the gas diffusion layers (5) and (6) to front and reverse sides of the catalyst-coated ion-conducting membrane with the aid of elevated pressure and/or elevated temperature.
13. A process for producing a membrane-electrode assembly having an integrated sealing material, which comprises
- 35 - providing an ion-conducting membrane (1) having at least one catalyst layer applied to the entire area,

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- positioning the sealing material (4) on one side in the edge region of the ion-conducting membrane (1),
 - 5 - positioning the gas diffusion layers (5) and (6) on front and reverse sides of the catalyst-coated ion-conducting membrane,
 - 10 - bonding the structure at elevated pressure and/or temperature.
14. The process as claimed in claim 11, wherein the pressure (quoted as area pressure based on the frame area of the sealing material) is in the
- 15 range from 50 to 300 N/cm² and the temperature range is from 20 to 200 °C.
15. The process as claimed in claim 12 or 13, wherein the pressure (quoted as area pressure based on the
- 20 area of the gas diffusion layer) is in the range from 50 to 200 N/cm² and the temperature range is from 20 to 200 °C.
16. Use of the catalyst-coated ion-conducting
- 25 membranes as claimed in any of claims 1 to 7 for producing membrane-electrode assemblies for electrochemical devices, in particular for fuel cells.
- 30 17. Use of the membrane-electrode assemblies as claimed in any of claims 8 to 10 for electrochemical devices, in particular for fuel cells.